

Zodiac Arresting Systems

Review of the Performances of EMAS Systems in Live Arrestments

August 2014



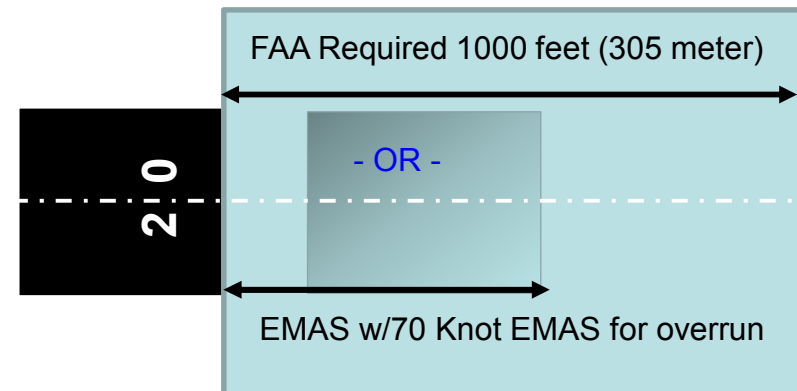
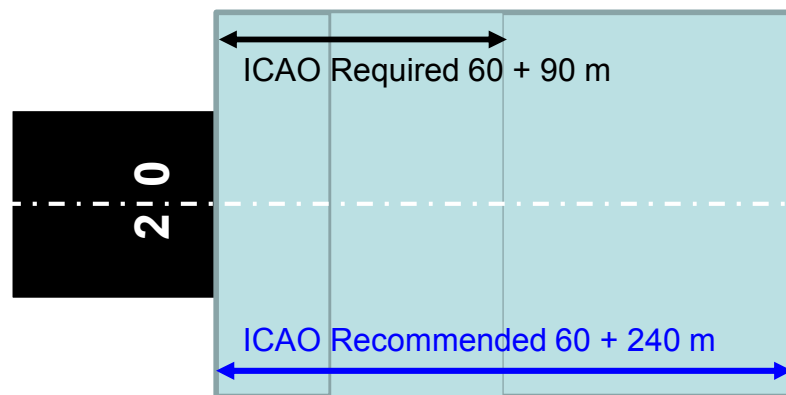


- **EMAS and RESA/RSA Overview**
- **EMAS Arrestments**
- **Key West International Arrestment Details**



Runway End Safety Areas (RESA/RSA)

- Definition: A defined, prepared surface beyond the runway end suitable for **reducing the risk of aircraft damage or injury to the passengers and crew** in the event of an undershoot, overrun, or excursion from the runway.
- Provides a safety margin for aircraft that overshoot the runway surface.



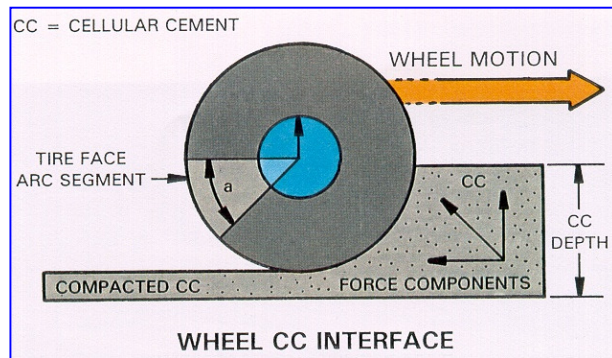
What is EMASMAX®

- A bed of cellular cement blocks encased in an environmental cover
- Passive, reliable, and predictable
- Providing gentle and consistent deceleration



Theory of Operation

- Tire/material interface provides resistive loads to decelerate the aircraft
- Loads are placed on the aircraft landing gear and support structure
- ZASA's FAA-Approved computer model is used to determine final arrestor bed configuration



FAA Guidance for EMAS

- **Advisory Circular AC150-5220/22a, “Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns”**
 - Defines the requirements for an EMAS System
 - Fire resistant
 - Chemical resistant
 - Hot/Cold resistant
 - Jet Blast resistant
 - Accessible by ARFF vehicles
 - No adverse affects to aircraft landing short
 - Consistent performance in all weather conditions
 - Predictable Performance (and a method to predict the performance)
 - Minimal potential for damage to aircraft or injury to occupants
- **A “Standard” EMAS provides 70 Knot Protection**
- **A “Minimum” EMAS provides 40 Knot Protection**

EMAS Configuration

- Each EMAS is configured based on:
 - The aircraft that operate on the runway
 - The length and width of the runway
 - The elevation of the runway
 - The length of available RESA
 - The slope of the RESA
- Performance is predicted based on:
 - Poor aircraft braking and no reverse thrust from runway exit to entry of EMAS
 - No aircraft braking or reverse thrust once aircraft enters EMAS
 - Aircraft at field-adjusted MTOW
 - Aircraft at field-adjusted 80% MLW



Arrestment History for EMAS 100% Successful

- SAAB 340, JFK 4R, 70+ knots, May 1999
- MD-11, JFK 4R, 30+ knots, May 2003
- B747, JFK 4R, 70 knots, Jan 2005
- Falcon 900, GMU 01, 30+ knots, Jul 2006
- A320, Midwestern Int'l Airport, July 2008
- CRJ-200, CRW 23, 50+ knots, Jan 2010
- Gulfstream IV, TEB 06, 40+ knots, Oct 2010
- Citation 550, EYW 09, 60 knots, Nov 2011
- Citation 680, PBI 14, XX knots, Oct 2013
- **86 Systems worldwide with more planned**



Photo Courtesy of the PANYNJ



Photo Courtesy of Yeager Airport



Photo Courtesy of Key West Int'l Airport



Photo Courtesy of the PANYNJ

Charleston (CRW) Airport Arrestment

19 Jan. 2010: CRJ-200 regional jet, aborted takeoff, 50+ kts



**No injuries to 34
passengers and crew**

**Runway reopened within
5 hours**

**Aircraft returned to
service (3 days)**



ZODIAC AEROSAFETY
ZODIAC ARRESTING SYSTEMS DIVISION

**ZODIAC
AEROSPACE** 

Teterboro (TEB) Airport Arrestment

2010 October: Gulfstream IV, 40+ knots

Prior to EMAS Installation -
Overrun
February 2005



Teterboro, NJ Airport
Runway 06 Departure
EMAS Installed 2006



Arrestment
October 2010



Other EMAS Successes



May 1999 – New York JFK 4R
SAAB 340 @ 70+ Knots



May 2003 – New York JFK 4R
MD11 @ 30+ Knots



January 2005– New York JFK 4R
B747-200F @ 70 Knots



July 2005 – Greenville SC GMU 01
Falcon 900 @ 30+ Knots

EYW: Key West International Airport Arrestment

Peter Horton

Director of Airports
Monroe County, FL



ONE
in a Million

TWO
in a Week



THIS
is the story
of
TWO
Runway Excursions
only
THREE
days apart

First a little history...

In the year 2000

EYW

**like many
other airports
had virtually**

NO

RUNWAY SAFETY AREAS



WEST END VIEW RUNWAY 09



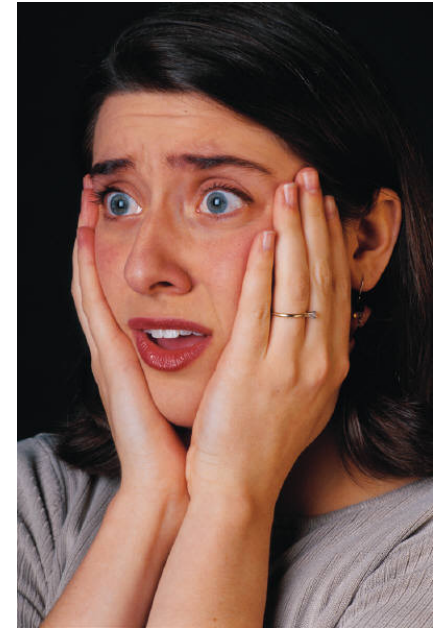


**EAST END VIEW
RUNWAY 27**

This drove our Risk Manager crazy.



So obviously...



We needed to install Runway Safety Areas



Through the entire **TEN YEAR PROCESS** of permitting this RSA project...

We were told...
CONTINUOUSLY
by the
ENVIRONMENTAL
Regulatory Agencies
and
ENVIRONMENTAL
Groups...





That
this
project
was
NOT NEEDED...

WHY?! Because...



it had been
THIRTY YEARS
since an aircraft
had gone off
the end
of the Runway



That's a
ONE
in a
MILLION
Occurrences...

**And the project is
NOT WORTH
the
ENVIRONMENTAL
DISRUPTION
it would cause.
(they said)**



However...

**WE ULTIMATELY
PREVAILED**

and completed



**THE RUNWAY SAFETY AREAS IN
MAY OF 2011**

Here's what we did

WEST END





EAST END

**Just in time too
because...
on**



OCTOBER 31, 2011

**Halloween
Night**

A Gulfstream G-150

WENT OFF THE
east end of

RUNWAY 27





October 31, 2011 Aircraft Accident

Gulfstream G-150 – N480JJ
Jimmie Johnson Racing II, Inc. and
Hendrick Motorsports, LLC
EIR# 2012SO800005





10/31/2011 19:45



10/31/2011 19:46



10/31/2011 19:49





So, OK



**I've just had my
ONE
IN A MILLION
I'm done, right?!**

WRONG!!

Because...



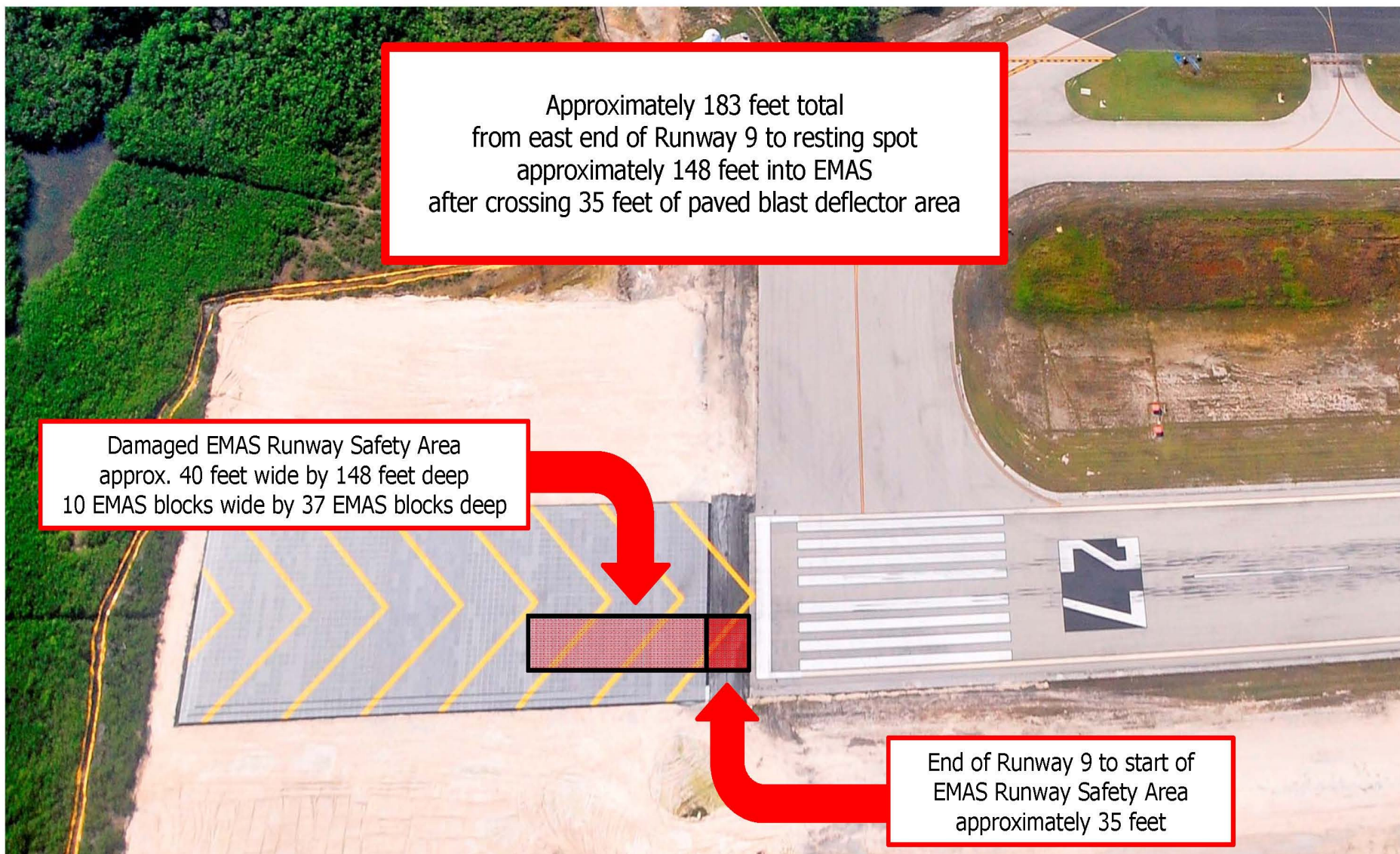
THREE days later

on November 3, 2011

A Cessna CITATION 550



GOES OFF
the
opposite end
of the
RUNWAY!



November 3, 2011 Aircraft Accident

Cessna Citation – N938D

JODA LLC

EIR# 2012SO800007



North









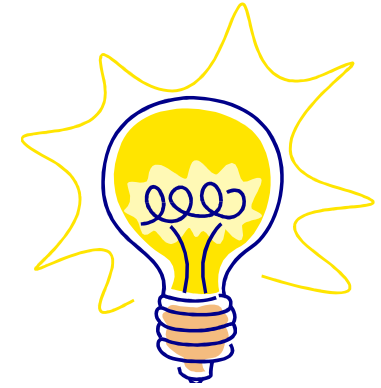


Well, obviously...



**the
ONE
in a million
can happen
OVER & OVER & OVER
again**

**And... it's a pretty good
idea to have**



AN EMAS BED ON BOTH ENDS OF THE RUNWAY

**Which is EXACTLY what we
are going to do!**

Proposed EMAS Bed for the West End.

But wait...



THERE'S MORE!

We have...

a **SHORT VIDEO**



of the Runway Excursion into EMAS

2011 Nov 03 12:03:21 PM



ZODIAC AEROSAFETY
ZODIAC ARRESTING SYSTEMS DIVISION

ZODIAC
AEROSPACE 

**EMAS Installation
Yeager Airport
Charleston, WV**

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